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make the results of such studies available to the general student, without at the same time compelling him to become a specialist himself (at least for the time being), at the cost of time and mental strain that can be more profitably otherwise employed. Excessive, and especially premature specialization, *preceding* instead of *succeeding* the establishment of a broad basis of general knowledge, is recognized as one of the most serious evils of our present system of scientific training and investigation. The specialist is becoming less and less capable of fruitfully correlating his results with the general facts and principles of the cognate branches of science, and the overweening self-esteem born of narrow training and ignorance of wider fields, is too often apparent both in writings and personal intercourse. At the same time, the coining of unnecessary new terms and names, more especially indulged in by this class of investigators, renders even their good work difficultly available to students outside of their specialties. Among the most aggravated and aggravating difficulties so imposed is the introduction of new generic names upon the basis of discrimination alleged to be cogently 'generic'; a tendency fostered by the ambition to have one's name forever associated with such new names.

Now if, as evolutionists must hold, genera, and orders as well, are essentially group arrangements made by man for the purpose of subsuming related forms under a general point of view for more ready and fruitful study, it would seem that the more comprehensive such points of view can be made, the better the main purpose will be subserved. So far from being closely *limited*, the definition of the genus should be as *wide* as possible; so that for the purposes of the general student, its members would be called by the most comprehensive name compatible with the objects of general

study.* The specialist, on the other hand, may make use of the wider designation so far only as it may be useful for his discussion, while employing for the minor subdivisions required by his new points of view, such 'subgeneric' or 'sectional' designations as have heretofore stood for ill-defined genera.

It seems to the writer that the generalized point of view could thus be kept within convenient reach of the general student, while the subgeneric designations would afford the specialist ample facilities for discussion with his fellow-workers. Anyone desiring to specialize in a particular line would readily familiarize himself with the specialist's subgeneric or sectional terms. It would seem that in this way, the interests of both classes of students, as well as of science at large, would be effectually safeguarded and fostered, and the participation of a wider constituency in science study essentially facilitated.

E. W. HILGARD.

THE CARD INDEX OF EXPERIMENT STATION PUBLICATIONS.

IN view of the recent discussions regarding card indexes of scientific literature many of the readers of SCIENCE may be in-

* A striking example of the opposite principle appears in Bulletin 18 of the Division of Agrostology, 'Synopsis of the genus *Sitanion*.' In the introduction, Scribner, in giving the characters upon which the genus is based as distinct from *Elymus*, remarks that they '*justify* the separation of these species as a distinct genus,' although "to be sure there are species so closely connecting *Elymus* with *Sitanion* that it is difficult to say to which genus they ought to be referred." These intermediate forms "indicate their close relationship, but this fact does not afford sufficient reason for *uniting* them. * * *"

Here it is evident that the view held is that genera should be as *closely limited* as possible; regardless of the fact that the obvious close resemblance of these plants will put every student, not a specialist, to the trouble of eliminating all the species of the well-known genus *Elymus* before considering the unfamiliar *Sitanion*; which as a subgenus of the former would have just the standing its slight structural differences seem to justify.

terested to know something about such an index which is regularly issued by the Office of Experiment Stations of the United States Department of Agriculture. The general plan of the index may be briefly outlined as follows :

The subjects with which agricultural science deals have been grouped under thirteen general topics. These topics have been divided and subdivided only so far as seemed necessary to facilitate references to the individual entries of the index. As the work of the stations reaches out in many directions into the domain of pure as distinguished from applied science, a section of the index has been set apart for entries relating to the general principles of the various sciences which lie at the foundation of experimental investigations in agriculture. This affords a wide opportunity for the extension of the index by individual students for their own special purposes.

The index is printed on cards of a standard library size. The divisions and subdivisions are arranged on a decimal system and are plainly indicated by the use of division cards of different colors.

Each index card contains the title of an article, the name of its author, a reference to the publication in which it appeared and to the Experiment Station Record, and a condensed statement of its contents. At the upper right-hand corner of the card is a number indicating under what head the card should be placed in the index. The order in which the cards are printed is indicated in the lower left-hand corner.

A key to the index, containing the system of classification, is sent with the first installment of cards.

While planned so that any scientific and other literature relating to agriculture might be included, the index has thus far been confined to the publications of the agricultural experiment stations in this country.

One copy of the index is sent without

charge to each of the agricultural colleges and experiment stations and the State boards of agriculture. Besides this free distribution, the Office is prepared, under the authority of the law, to furnish a limited number of sets of the index at a price only sufficient to cover additional cost of printing. This is estimated at \$2 per thousand cards. For the division cards an additional charge of \$1.25 is made.

The Office has now issued 18,000 index cards and a set of division cards. Three hundred sets of this index are printed.

Experience has shown many difficulties in making such an index thoroughly satisfactory. Where publications are issued as irregularly as those of the experiment stations necessarily are, the systematic indexing of their contents inevitably prevents the bringing of the index closely up to date. To keep the number of cards within reasonable limits and satisfy the needs and demands of specialists in different subjects is practically out of the question, especially in such subjects as entomology, where many different topics are often treated in a single article and the important article consists of a series of short notes.

The chief value of such an index seems to lie in the fact that it enables the user to get together rapidly a considerable amount of information on many of the topics included in it. Thus the student, teacher or lecturer is helped in his work in various ways. But when it is desired to make an exhaustive study of any subject the card index is likely to be of comparatively little use unless it could be made very extensive, in which case few libraries would care to give it room.

For the thorough examination of the literature of any scientific subject, I believe that no work of reference can compare with a well-made abstract journal having a detailed subject and author index. Such an index the Office of Experiment Stations at-

tempts to make for the Experiment Station Record. The ninth volume of the Record contains 1,100 pages of text, of which 770 pages are taken for abstracts of publications originally occupying 56,569 pages. In addition to this, the volume contains 2,471 titles of articles, with brief abstracts in some cases. The index of names for this volume fills 15 pages printed in nonpareil type in three columns; the index of subjects fill 80 pages printed in the same type in two columns.

Now that ten volumes of the Record have been completed, the question of making a general index to cover them has been raised. If such an index can be provided for at intervals of ten years it is believed that this and the annual indexes with a set of the Record will constitute an instrument for ready reference to the literature of agricultural science much more convenient and effective for the uses of the specialist than any card index can be.

A. C. TRUE.

WASHINGTON, D. C., October 23, 1899.

SCIENTIFIC BOOKS.

West Virginia Geological Survey. Volume I.

By I. C. WHITE, State Geologist, Morgantown, W. Va. 1899. 8vo. 392 pp. Map.

Dr. White was commissioned as State Geologist in 1897 and began work in the autumn of that year. This first volume gives only a portion of the material accumulated prior to the close of 1898, as the appropriation for printing was very small. Political complications during the session of 1899 hindered legislation and the survey work will remain suspended until after the next session of the Legislature.

At the time this survey was undertaken, the all-absorbing matter of economic interest was that of oil and gas, with which Part IV. of the report, occupying 270 pages, deals. The historical sketch of discovery, methods and utilization of oil and gas in the State is followed by a discussion of the geology of those products, treating of method of occurrence; quantity to the acre; aids in location; anticlinal theory;

relation of oil and gas to structure; and other topics full of interest, viewed from the standpoint either of pure science or economics. The anticlinal or structural theory of the occurrence of oil and gas, presented by Dr. White many years ago, is elaborated here in the light of developments made in the Ohio and West Virginia fields. Though leading to slight modification of statements made when the theory was rather suggested than asserted, these severe experimental tests have rendered necessary no material changes, but on the contrary have shown that the theory was but the expression of a law. One cannot give a synopsis of the discussion for that is itself a model of condensation. It possesses much interest not only for the student of economic geology, but also for those geologists who find little that is attractive in matters relating to economic interests.

The general section through which wells have been drilled is described. It extends from the Permo-Carboniferous to the Corniferous limestone, a total of 7,200 feet, a thickness contrasting notably with that in south central Pennsylvania, where the upper Devonian alone (the Chemung and the Catskill of Vanuxem) is as great. The records of 104 wells drilled in different parts of the State are discussed in detail, compared with each other and with localities where the rocks are exposed. These wells are from 1,000 to more than 4,000 feet deep. The labor involved in working up the bald records into intelligible sections, of identifying the several coal beds and the subordinate sands, can hardly be conceived by those who have not done such work; the more so, since necessarily the published records form but a small part of those studied in order make the comparisons conclusive. The writer in the course of a study, still in progress, tabulated all these records given by Dr. White to compare them with results obtained by other observers in West Virginia, Ohio and Pennsylvania. Out of all the many points at which the several sets of observations came together, only two were found where it seemed impossible to accept Dr. White's conclusions—and in one of these Dr. White proved to be right.

This volume is a contribution so important that one cannot fail to regret the neglect of the